

REMARKS

The claims are 1-12.

The examiner rejects claims 1-12 under 35 USC 102(b) over US 5,166,427 ('427) or DE 199 43 844.

THE REJECTION OVER DE 199 43 844

Preliminarily, it is noted that the "publication" date is not 13 Sep 99, as set forth by the examiner; that is the German application date. Rather, the publication date ("Offenlegungstag") is 15 Mar 01, less than one year prior to the instant filing date. ("Mistakes are inevitable....", *Helfgott & Karas P.C. v. Dickinson*, 54 USPQ2d 1425; 1426 (Fed.Cir. 2000)).

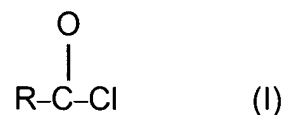
Further, applicants file herewith a verified translation of applicants' benefit application. In the Office Action, the examiner acknowledges receipt of the certified copy. Thus, pursuant to 35 USC 119, applicants are entitled to the benefit date of their corresponding German Application, 13 Sep 99, the same filing date as that of the reference. (It is also noted that the inventors and their assignee are the same.)

It is also called to the examiner's attention that the reference's corresponding US application is Serial No. 10/070,864, filed 12 Mar 02, the same filing date as that of the instant application.

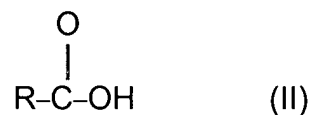
Accordingly, the rejection is no longer applicable.

THE REJECTION OVER US 5,166,427 (HOHMANN)

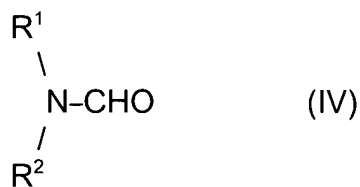
Hohmann's prepares an acyl chloride of the formula:



where R is C₈-C₃₀-alkynyl, comprising reacting a carboxylic acid of the formula



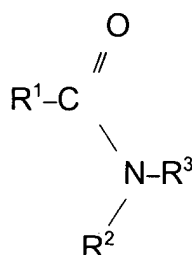
where R has the above-mentioned meanings, and phosgene, COCl₂, (III), in the presence of a catalyst adduct of phosgene and an N,N-dialkylformamide of the formula



where R¹ and R² independently of one another are each C₁-C₃-alkyl, the improvement which comprises: carrying out the reaction with the carboxylic acid II and the phosgene III reactants in substantially equimolar amounts while using said catalyst adduct in an amount of from 5 to 200 mol.%, based on the carboxylic acid II; allowing the reaction mixture containing the acyl chloride I product to separate into two phases; separating the lower phase formed by the catalyst adduct from the upper product phase; and reusing the lower phase containing the catalyst adduct.

However, the instant invention relates to a process for the purification of carbonyl chlorides which have been prepared by reacting carboxylic acids with phosgene or thionyl chloride in the presence of a catalyst adduct, i.e., which have been prepared,

e.g., by the process of Hohmann et al., which comprises the measures of treating the crude carbonyl chlorides thus obtained with a hydrohalide of carboxamides of the formula



the mutual solubility of the carbonyl chlorides and the hydrohalides of the said carboxamides being low, and isolating the carbonyl chloride purified in this way by separation from the carboxamide phase.

Hohmann et al. do not disclose such a purification process, but instead teach that “the acyl chloride is obtained...in high purity. It can be used without further purification, for example distillation or filtration” (cf. col. 3, lines 29-31 of Hohmann et al.). Consequently, the disclosure of Hohmann et al. can not anticipate the instantly claimed process. Thus, with respect to the isolation of the carbonyl chloride product, the teaching of Hohmann et al. ends with “separating the lower phase formed by the catalyst adduct from the upper product phase” (cf. claim 1 of Hohmann et al., col. 6, lines 40-41). Although the purity of the carbonyl chlorides obtained by the process of Hohmann et al. is rather high (up to 97%), Hohmann et al.’s carbonyl chlorides have a high color number (APHA) caused by impurities being present in very low quantities in the product. It was an object of the instant invention to reduce this high color number.

This goal was achieved by the process according to the instant invention as it is evidenced by the examples of the instant specification.

Thus, in Example 1 of the instant specification the color number or 268 APHA of lauroyl chloride obtained by process 1 which corresponds to the process of Hohmann et al. (cf. page 14, line 45 to page 15, line 14, of the instant specification), was reduced to 48 APHA by the treatment according to the instantly claimed process. This corresponds to a reduction in color number by 82 percentage points.

In Example 2 of the instant specification the color number of 399 APHA of coconut fatty acid chloride obtained by the process of Hohmann et al. was reduced to 64 APHA by the treatment according to the instant invention. This corresponds to a reduction in color number of almost 84 percentage points. In Example 5 of the instant specification the reduction of the color number of pivaloyl chloride achieved by the instantly claimed process amounts to 90 percentage points.

These results are really unexpected and clearly negate the argument presented by the examiner, viz. "Granted that the reference introduces the N,N-dialkylformamide in the reaction mixture, the N,N-dialkylformamide is added in excess with respect to the carboxylic acid. Applicants have not established a higher degree of purity if the N,N-dialkylformamide is added subsequent to the preparation of the acyl halide," which is apparently inaccurate because:

- a) according to the instantly claimed process a hydrohalide of an N,N-dialkylformamide is added to the crude acyl chloride for purification but not an

N,N-dialkylformamide as it is taught by Hohmann et al. for the preparation of the catalyst adduct;

- b) the N,N-dialkylformamide introduced by Hohmann et al. into the reaction mixture is completely converted to the catalyst adduct in that Hohmann teaches the feeding of phosgene into the reaction mixture, in addition to those quantities of phosgene required for the formation of the catalyst adduct (cf. col. 2, lines 63-66);
- c) if, despite b), unconverted quantities of N,N-dialkylformamide were present in the reaction mixture, they would at best dissolve in the less polar upper product phase generated by the process of Hohmann et al., but not in the lower ionic liquid phase of the catalyst adduct (which is a salt) and, hence, would not contribute beneficially to the extraction of colored by-products into the ionic liquid catalyst adduct phase but rather would interfere detrimentally with such extraction by retaining such by-products dissolved in the product-phase, however, if large quantities of unconverted N,N-dialkylformamide were present in the reaction mixture this could even impede the phase separation of the product phase from the catalyst phase, all of the foregoing effects having a disadvantageous impact on the product purity;
- d) indeed when preparing the crude carbonyl chlorides (cf. process 1 of the instant application; page 14, line 45 to page 15, line 14) applicants worked totally in line with the teaching of Hohmann et al., i.e., in line with the state of the art at the

time the instant invention was made; following the examiner's suggestion of adding an excess the N,N-dialkylformamide to the reaction mixture would have been tantamount to a deviation from the teaching of the prior art, totally unsupported by such prior art.

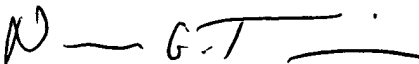
Accordingly, the subject of the instant application is not only novel with respect to Hohmann et al., but applicants have also demonstrated an unexpected decrease of the color number of the acyl chlorides produced according to Hohmann et al. caused by the use of the instantly claimed process. Since there is no suggestion made or incentive given by the teaching of Hohmann et al. to carry out the instantly claimed purification, the instantly claimed process also is unobvious and inventive in view of the teaching of Hohmann et al. and, hence, is patentable.

CONCLUSION

Accordingly, allowance is respectfully solicited.

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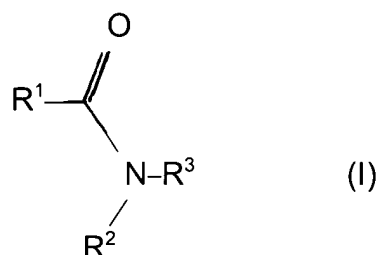
Respectfully submitted,
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COMPLETE LISTING OF ALL CLAIMS IN THE APPLICATION

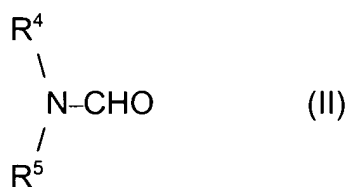
1. (original) A process for the purification of carbonyl chlorides which have been prepared by reacting carboxylic acids with phosgene or thionyl chloride in the presence of a catalyst adduct, which comprises treating the carbonyl chlorides with a hydrohalide of carboxamides of the formula (I)



- in which R¹ is hydrogen or a C₁- to C₃-alkyl; R² and R³ independently of one another are C₁- to C₄-alkyl, or R² and R³ together are a C₄- or C₅-alkylene chain, the mutual solubility of the carbonyl chlorides and the hydrohalides of the carboxamides (I) being low, and isolating the carbonyl chloride purified in this way by separation from the carboxamide hydrohalide phase.
2. (original) A process as claimed in claim 1, wherein, for the treatment of the carbonyl chlorides, an amount of carboxamide hydrohalide of from 1 to 80% by weight, based on the amount of carbonyl chloride employed, is used.
3. (previously presented) A process as claimed in claim 1, wherein the carboxamide hydrohalide used is N,N-dimethylformamide hydrochloride.
4. (previously presented) A process as claimed in claim 1, wherein the treatment with

the carboxamide hydrohalide is carried out at a temperature of from -15 to 80°C and a pressure of from 0.5 to 5.0 bar abs.

5. (previously presented) A process as claimed in claim 1, wherein, as catalyst precursor for the catalyst adduct to be formed, an N,N-disubstituted formamide of the formula (II) is used



in which R⁴ and R⁵ independently of one another are C₁- to C₄-alkyl, or R⁴ and R⁵ together are a C₄- or C₅-alkylene chain.

6. (previously presented) A process as claimed in claim 1, wherein the catalyst precursor according to the formula (II) used is N,N-dimethylformamide.
7. (previously presented) A process as claimed in claim 3, wherein the N,N-dimethylformamide hydrochloride, after it has been used as treatment agent, is used as catalyst precursor in the carbonyl chloride synthesis.
8. (previously presented) A process as claimed in claim 1, wherein most of the carbonyl chlorides used originate from the reaction of carboxylic acids with phosgene in the presence of a catalyst adduct.
9. (previously presented) A process as claimed in claim 1, wherein the carbonyl chlorides to be purified are acetyl chloride, propionyl chloride, butyryl chloride, valeryl chloride, isovaleryl chloride, pivaloyl chloride, caproyl chloride,

2-ethylbutyryl chloride, enanthyl chloride, capryloyl chloride, 2-ethylhexanoyl chloride, pelargonoyl chloride, isononanoyl chloride, capryl chloride, neodecanoyl chloride, lauroyl chloride, myristoyl chloride, palmitoyl chloride, stearoyl chloride, oleoyl chloride, linoleoyl chloride, linolenoyl chloride, arachidoyl chloride and behenoyl chloride, and mixtures thereof.